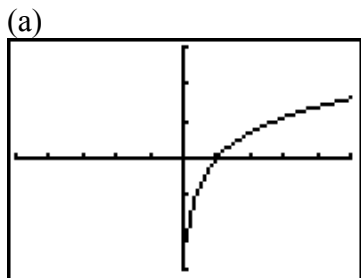


This take-home quiz is due at the beginning of class on Monday, February 1. Late papers will not be accepted. If for any reason, you are unable to come to class on Monday, February 1, then you should e-mail me as much of your work as possible and turn in a hard-copy when you return to school.

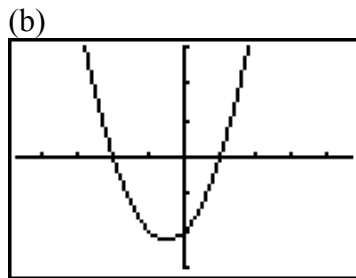
In order to get full credit, you must hand in your paper on time and you must show all of your work **neatly and clearly**. You may work with other classmates when doing the problems; however, each student must turn in his or her own paper.

Please list the names of any classmates with whom you worked on this quiz:

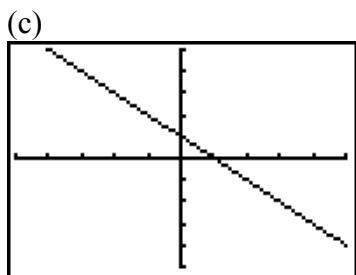
1. (4 points) Under each of the following graphs, state whether it is the graph of a constant, linear, quadratic, cubic, exponential, or logarithmic function.



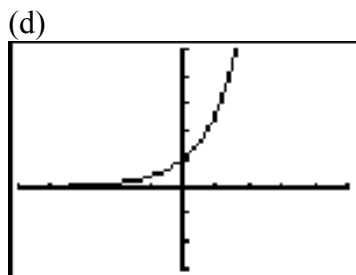
logarithmic



quadratic

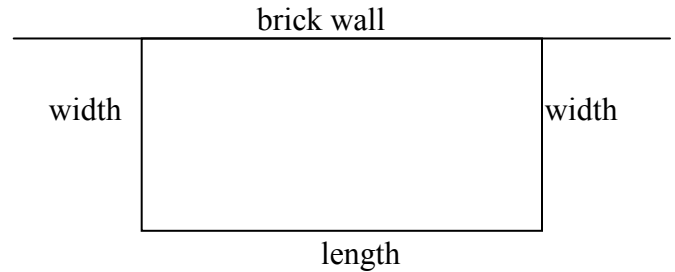


linear



exponential

2. (6 points) A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a long brick wall. **He needs no fencing along the wall.** Let the width of the field be represented by x . Find a formula for the area of the field as a function of x .



If the width is x , then the length is $(2400 - 2x)$ since the three sides must add up to 2400. The area of a rectangle is $(length) \cdot (width)$, so $A(x) = (2400 - 2x)x$ or $A(x) = 2400x - 2x^2$.

3. (7 points) The number of births in the United States declined during the 1990's. Past data showed that the decline appeared to be linear. The table below displays some of the data showing this trend.

Year	Number of births (in thousands)
1991	4111
1997	3895

- (a) Let y represent the number of births (in thousands) in the United States t years after 1990; that is, $t = 0$ corresponds to the year 1990. **Without using the STAT feature of your calculator**, express y as a linear function of t . No credit will be given unless appropriate work is shown.

Using the two points $(1, 4111)$ and $(7, 3895)$,

$$m = \frac{3895 - 4111}{7 - 1} = -36$$

$$y - 4111 = -36(x - 1)$$

$$y = -36x + 4147$$

$$\text{or } f(t) = -36t + 4147$$

- (b) What is the slope of the function and what does it represent? Write your answer in a complete sentence and use appropriate units.

The slope is -36 . It means that in the 1990's, the number of births in the United States was decreasing at a rate of 36,000 births per year.

4. (8 points) The following table contains United States population data for the years 1800 – 2000 at intervals of 20 years.

Year	U.S. Population (in millions)	Year	U.S. Population (in millions)
1800	5.2	1920	105.7
1820	9.6	1940	131.7
1840	17.1	1960	178.5
1860	31.4	1980	225.5
1880	50.2	2000	281.4
1900	76.0		

- (a) Let $y = f(t)$ represent the United States population (in millions of people) for the year that is t years after 1800; that is, $t = 0$ corresponds to 1800. Find linear, exponential, and quadratic regression models for $y = f(t)$. Write your results below. Use as many decimal places as your calculator shows.

linear: $y = 1.356772727t - 34.55909091$

quadratic: $y = .006912296t^2 - .0256864802t + 6.914685315$

exponential: $y = 7.811583444(1.019844508)^t$

- (b) On your calculator, graph your models along with the data. Which of these models do you think fits the data best? **quadratic**
- (c) Using the model you chose in part (b) estimate the United States population in 2010. Be sure to use appropriate units.
According to the quadratic model, the United States population in 2010 is 306.36 million. Based on the United States population clock, the current population is 308.57 million, so the estimate is fairly good.